

WHAT IS CLAIMED IS:

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1. A Belt force limiter for a vehicle, comprising:
a rotatable spool for winding and unwinding a belt;
a torsion bar which is fastened at one end to the spool and at the other end is mounted for rotation on the vehicle;
a locking device to block rotation of the torsion bar; and
a pin for releasably inhibiting a rotation of the spool.
2. The belt force limiter of claim 1, further comprising:
a flange attached to the spool, which can rotate with and relative to the spool, the torsion bar being attached at one end to the spool and at the other end to the flange, and
a locking device for blocking rotation of the flange, the pin being made for the releasable inhibition of rotation of the flange relative to the spool.
3. The belt force limiter of claim 2, wherein the consistency of the pin is such that inhibiting action on the spool from the pin can be ended by the reaching of a predetermined torque acting on the spool, with simultaneous blocking of the flange rotation.
4. The belt force limiter of claim 3, wherein the pin is formed of a shear pin which is configured so that, at a predetermined torque acting on the spool and upon simultaneous blocking of the flange rotation, the pin shears off, thereby canceling the inhibition of the rotation of the flange relative to the spool.
5. The belt force limiter of claim 2, wherein the predetermined torque corresponds to a force of at least 6672 N acting on the belt.
6. The belt force limiter of claim 2, wherein the pin is configured such that its blocking action on the spool can be canceled by the exceeding of a predetermined torque beyond a predetermined belt extraction length with simultaneous blockage of the flange rotation.

7. Belt force limiter according to claim 6, wherein the pin is deformable, and the flange has a slot opening into the cavity, and wherein upon the application of predetermined persistent torque to the spool a turning of the flange relative to the spool can be started, whereby the deformable pin is forced into the slot, bent, and drawn out of its cavity, thereby canceling the inhibition of the rotation of the flange relative to the spool.
8. The belt force limiter of claim 7, wherein the slot runs perpendicular to the axis of rotation of the flange.
9. The belt force limiter of claim 8, wherein the slot runs substantially semicircularly around the axis of rotation of the flange.
10. The belt force limiter of claim 8, wherein the slot runs in the face of the flange that faces the spool.
11. The belt force limiter of claim 2, wherein the spool and the flange each have a cavity running in length substantially parallel to their axis of rotation for the accommodation of the pin.
12. A belt force limiter for a vehicle, having:
a rotatable reel for winding and unwinding a belt,
a torsion bar which is attached at one end to the reel and at the other end is mounted for rotation on the vehicle,
a locking device to block the ability of the torsion bar to turn, and
a clutch for the releasable blocking of a rotation of the reel.
13. The belt force limiter of claim 12, wherein by means of the clutch a tensional connection between the reel and the vehicle can be made.
14. The belt force limiter of claim 13, wherein the tensional connection is made by frictional force.
15. The belt force limiter of claim 12, wherein the clutch has a guiding ring which can rotate relative to the reel, with at least one guiding slot and a clutching element guided

for movement therein, and the clutching element can be shifted by rotation of the guiding ring from a rest position to a blocking position wherein a rotation of the reel is blocked.

16. The belt force limiter of claim 15, wherein at least one clutching element has a clutching surface facing radially outward which engages the reel by shifting to the blocking position.
17. A belt device for a vehicle, having:
a belt force limiter with a rotatable reel for winding and unwinding a belt, a torsion bar which is attached at one end to the reel and at the other hand is mounted for rotation on the vehicle, a locking device for blocking the ability of the torsion bar to turn, and a clutch for the releasable blocking of the rotation of the reel, and
a belt tightener with a drive shaft attached to the clutch, the reel being rotated by rotation of the drive shaft and the belt can be wound and thus tightened.
18. The belt device of claim 17, wherein the clutch has a guiding ring which can rotate relative to the reel, having at least one guiding slot and a clutching element guided for movement therein, and the clutching element can be shifted by rotation of the guiding ring from a rest position to a blocking position wherein a rotation of the reel is blocked.
19. The belt device of claim 18, wherein the dogs are articulated on a coupling element and the coupling element is attached to the guiding ring and the drive shaft.
20. The belt device of claim 19, wherein the coupling element is attached to the guiding ring in the area of the center thereof, and the connection of the center point area with the outer area of the guiding ring in which the at least one guiding slot runs is elastic, so that a rotation of the drive shaft brings about a turning of the central area relative to the outer area, whereby the clutching element in the guiding slot can be changed to the blocking position.
21. The belt device of claim 20, wherein the guiding ring has blocking elements, and when

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the belt unwinds and the reel connected thereto rotates, a rotation of the guiding ring, an engaging of the blocking elements with the vehicle, a blocking of the rotation of the guiding ring, and a shifting of the clutching means from the blocking position to the rest position can be produced.

22. A method for reducing the danger of injury to a vehicle occupant by means of a restraining system which has a crash sensor, a three-point safety belt and a system for belt force limitation, wherein in case of an accident, immediately after detection of an accident by the crash sensor, the method comprising the steps of:
 - permitting a rapid and brief increase of the belt force to an elevated level of force which is above the level of force which the system for belt force limitation assumes upon commencement of the belt force limitation, and
 - reducing the belt force from an elevated level of force before the process of belt force limitation begins.
23. The method of claim 22, wherein the elevated level of force is in the range of about 6-9 kN.
24. The method of claim 23, wherein the level of force which the system for belt force limitation assumes when belt force limitation begins, is in the range of about 4-5 kN.
25. The method of claim 22, wherein the rapid and brief increase of the belt force to an elevated level of force is initiated about 25-35 ms after the crash sensor is activated
26. The method of claim 25, wherein the brief increase of the belt force lasts for about 5-15 ms.
27. The method of claim 22, wherein the increase of the belt force to the preset level of force is initiated by the shearing off of shear pins.
28. The method of claim 22, wherein the increase of the belt force to the preset level of force is initiated by the release of a clutch.
29. The method of claim 22, wherein the reduction of the belt force is initiated by the

disengagement of frictional elements which are in engagement with one another.

30. The method of claim 22, wherein a torsion bar is used for belt force limitation, and wherein the belt force is lowered to the level of force which corresponds to that of the torsion bar.
31. The method of claim 22, wherein the increase of the belt force to an elevated level of force after a tightening of the safety belt is permitted.

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